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Part A -- Northern California

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SAND AND GRAVEL IN CALIFORNIA

AN INVENTORY OF DEPOSITS

Part A -- Northern California

By HAROLD B. GOLDMAN, Mining Geologist
California Division of Mines

BULLETIN 180-A
CALIFORNIA DIVISION OF MINES
Ferry Building, San Francisco, 1961

STATE OF CALIFORNIA
EDMUND G. BROWN, *Governor*
DEPARTMENT OF NATURAL RESOURCES
DeWITT NELSON, *Director*
DIVISION OF MINES
IAN CAMPBELL, *Chief*
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ABSTRACT

A reconnaissance field investigation of sand and gravel deposits in 17 counties in northern California was conducted from 1958-1960. Deposits that were worked commercially and undeveloped deposits of commercial interest were examined. Fixed plants were visited, pits sampled, and gravel examined in the laboratory.

Stream deposits, dredge and hydraulic tailings and fluvioglacial deposits are the principal sources of sand and gravel in northern California. The bulk of sand and gravel occurs in the stream beds, flood plains, terraces, and alluvial fans of the major streams. Portions of certain streams were worked in the past by gold dredges and their trailings also constitute significant sources.

In 1959, approximately 8 million tons of sand and gravel valued at about 8½ million dollars was produced from the northern counties covered in this report. Commercial operations are located close to population centers on portions of the streams where a minimum of processing is required. Plants are relatively simple and have capacities ranging from 25 to 400 tons per hour. Concrete or bituminous aggregate and road base are produced. Data on the individual deposits including laboratory test data obtained from the California Division of Highways are presented in a tabulation. The locations and extent of the deposits are shown on an accompanying map.

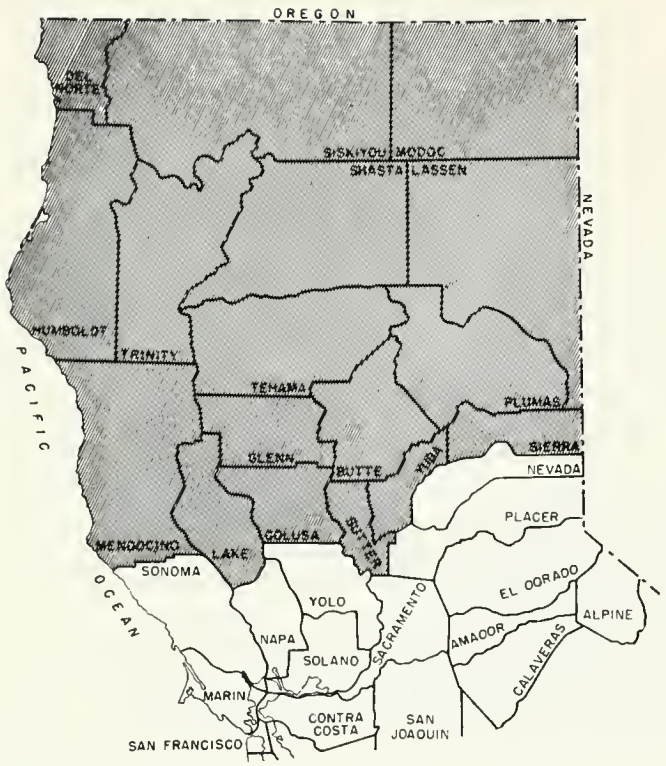

Figure 1. Map of California showing oreo covered in this report.

SAND AND GRAVEL IN CALIFORNIA

AN INVENTORY OF DEPOSITS

PART A—NORTHERN CALIFORNIA

By Harold B. Goldman

INTRODUCTION

This report is the first of a three-part bulletin on the occurrence of sand and gravel in California. Part A includes the results of field investigations of sand and gravel in an area designated as northern California. For the purpose of this study, this includes 17 northern counties (Butte, Colusa, Del Norte, Glenn, Humboldt, Lake, Lassen, Mendocino, Modoc, Plumas, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, and Yuba). The area covered in this report is shown in Figure 1.

Purpose. The purpose of this investigation was to obtain the basic information necessary to a statewide inventory of sand and gravel deposits including the location and extent of deposits, geology, and status of commercial development.

Scope of Investigation. Field investigations of a reconnaissance type were conducted in the fall of 1958, early 1959, and summer of 1960. The location and extent of the deposits were plotted in the field on U. S. Geological Survey topographic maps on a scale of 1:62,500 or 1:24,000. Field determinations were checked in the office with U. S. Department of Agriculture soils maps, geologic maps, and aerial photographs (whenever available). Samples of representative materials were taken in the field and later examined in the Division's petrographic laboratory.

Only the deposits that were or had been worked commercially, and the undeveloped deposits of potential commercial significance were visited. In instances where commercial production was obtained from an extensive geologic formation such as an old conglomerate, only the developed portion of the deposit was delineated. Small deposits (under 50,000 cu. yds.) in remote areas were excluded.

The fixed commercial plants were visited, operators interviewed, and their pits examined. Data on some operators who use portable equipment have been included in the tabulation.

Test data on materials from the commercial operators were obtained from the files of the Materials and Research Laboratory of the California Division of Highways, and from the U. S. Bureau of Reclamation, 1938, Report C-30, Natural aggregate investigation, Shasta Dam, Central Valley Project. We wish to acknowledge the cooperation of the personnel of the Division of Highways in making their data available.

GEOLOGY OF DEPOSITS IN NORTHERN CALIFORNIA

Stream deposits, dredge and hydraulic mine tailings, and fluvioglacial deposits have all yielded commercial sand and gravel in northern California. The bulk of sand and gravel occurs as stream deposits; tailings and fluvioglacial deposits constitute a small portion of the total.

Stream Deposits. Sand and gravel occur in the stream beds, flood plains, terraces, and as bars along the major streams in northern California. The streams with extensive drainage basins (particularly the Smith, Mad, Eel, and Klamath) transport large quantities of sand and gravel at flood stage and have concentrated thick sections of sand and gravel near the ocean. The Sacramento River has a large drainage system but movement of material downstream is prevented by Shasta Dam. However, sand and gravel is continuously supplied by tributaries of the Sacramento River (i.e. Cottonwood, Thomes, Stony Creeks) below Shasta Dam and extensive deposits are present in terraces, abandoned flood plains, and bars along the Sacramento River.

Most of the stream deposits are replenished by seasonal floods. There is little or no overburden present, but a thin veneer of silt, clay, and wood debris brought in by high waters locally covers the deposits. The maximum size of gravel gradually decreases downstream in the streams with long drainages.

The rock types in each deposit reflect the source rocks within the drainage area. Streams that drain large areas of the Coast Ranges contain rock types typical of the Franciscan formation: graywacke, chert, greenstone and vein quartz. Gravel derived from the Klamath Mountains contains abundant gneiss and schist, and granitic rocks. In the upper Sacramento Valley, some of the streams tributary to the Sacramento River contain abundant Tertiary basalt and andesite derived from the Tuscan and Red Bluff formations. Ordinarily, the Coast Range-derived gravels are of lesser quality than Klamath Mt.—northern Sierran gravels. The reduction in quality is usually caused by the presence of weathered graywacke.

Dredge Tailings. Portions of certain streams (i.e. Feather, Trinity, Butte Creek, Yuba River) in northern California have been worked in the past by gold dredges, and the tailings from these operations now constitute significant sources of sand and gravel. However, the nature of the tailing piles are such that the coarser materials (cobbles and boulders) overlie the sand and it is difficult to obtain a proper blend of sand and gravel without processing excessive amounts of material. The tailings do constitute an excellent source of coarse aggregate.

Hydraulic Mining Debris. Sand and gravel have been concentrated by streams draining areas where debris has been swept in by past hydraulic mining practices. The materials in these deposits are related to the ancient gravelly formations which were worked and therefore reflect the lithology and size grades of the parent formation. For example, the outwash from the old Cherokee mine is composed predominantly of white, rounded, quartz pebbles from the Eocene auriferous gravels. Ordinarily, the mining debris contains hard, rounded, resistant gravels which have withstood several cycles of erosion and transport.

Photo 1 (left). Stream bed. The bulk of sand and gravel in northern California is found in the stream bed, flood plain, terraces, and alluvial fans of the major streams. Stream channel deposits are widely exploited as the deposits are accessible and easily mined. The absence of overburden, proximity to water for washing, and high quality of material add to the desirability of these deposits.

Photo 2 (below). Close-up of gravel. The natural abrasive action during stream transport removes weak rock and concentrates hard durable particles. The rock types in each deposit reflect the source rocks within the drainage area of the particular stream. Streams that drain large areas of the Coast Ranges contain rock types typical of the Franciscan Formation: smooth rounded graywacke cut by quartz veinlets (g), rough blocky chert (c) and vuggy irregular vein quartz (g). Approximately half size.

Photo 3. Dredge tailings. Dredge tailings from post gold mining activity are found along certain rivers and are potential sources of sand and gravel. Some tailings contain an excess of large cobbles and boulders and are crushed for use as road base or railroad ballast. Other tailings are unsuitable due to the presence of soft clayey material that has resulted from breakdown of rocks by intensive weathering or has been picked up by the dredge from the underlying bedrock.

ECONOMIC DEVELOPMENT

Production. The present market for sand and gravel in northern California is primarily in construction of public works such as roads, dams, bridges, and municipal facilities, and to a lesser extent in local construction. In 1959, approximately 8 million tons of sand and gravel valued at about 8½ million dollars was produced from deposits in the northern counties covered by this report. Of this total, 3¼ million tons was produced commercially, the remainder was non-commercial production by contractors for city, county, state, or federal agencies. This latter production was obtained mainly by the use of portable plants (usually with capacities of from 100 to 200 tons an hour) which are set up temporarily on stream deposits to produce aggregate for a specific job.

Mining Methods. Excavating of the sand and gravel is ordinarily done by dragline, although some operators prefer to use self-propelled bottom-dump scrapers. If possible, the dragline operator works below the water table to wash out fines and thereby facilitate the washing process at the plant. Diesel shovels are also used, mainly in areas that are dry all year around. End-dump trucks are used, in most instances, to haul the excavated material short distances to the plant.

Commercial operations are located close to population centers on portions of the stream where the natural size gradation of the deposit is such that the minimum amount of processing (especially crushing) is necessary. The majority of the fixed commercial plants are small to medium in size. Capacities range from 25 to 400 tons an hour; the average plant has a capacity of about 250 tons an hour of washed aggregate. The plants are relatively simple as they are designed for medium capacities. An average plant consists of primary jaw and secondary cone crushers (to crush oversize gravel for use as bituminous aggregate or road base); standard vibratory screens over which the gravel fraction is washed; and a screw-type sand washer and classifier. There are some plants that process materials from pits in which the size gradation is such that no crushing is necessary. Such plants contain only standard vibrating screens. All the commercial plants using stream deposits produce sand and gravel for use as concrete or bituminous aggregate and road base. The dredge tailings are ordinarily crushed for use as railroad ballast, road base, or bituminous aggregate.

Photo 4 (above). Dragline. The usual method of excavating sand and gravel in northern California is by means of a dragline working below the water table to take advantage of the washing action in removing clay and silt particles. By excavating with a dragline, portions of the deposit may be worked selectively to obtain either coarse or fine material as needed.

Photo 5 (below). Tractor-scraper. In dry stream beds, some operators use tractor-pulled scrapers to excavate sand and gravel. This eliminates loading trucks for haul to the plant as is necessary when a dragline is used. Selective excavation is difficult and debris brought in by winter floods may contaminate the sand and gravel.

PRESENTATION OF DATA

Data on the individual deposits are presented in the tabulation and include name and location and geologic description of the deposit, fixed plant descriptions, and laboratory test data. The tabulation is keyed to the accompanying map (plate 1) by being arranged alphabetically according to the name of the deposit, which in most instances is the related stream. An alphabetical cross index by operator is included at the end of the table. A comprehensive list of producers in northern California for 1959, arranged by county, is also included. This later list contains, in addition to the operators described in this report, the names and addresses of producers of sand and gravel who operate small portable plants or sell pit-run unprocessed material.

The locations and extent of the deposits which were visited and the fixed plants are shown on plate 1. The deposits were originally plotted on 1:24,000 or 1:62,500 topographic maps and reduced to the scale of the accompanying map. To show the deposits on this reduced scale, it was necessary to exaggerate the widths of the deposits. The true dimensions are given in the inventory table accompanying this report.

Old geologic formations, such as the Red Bluff, Tuscan, or Tehama formations, occur in northern California and contain conglomeratic material. These formations are potential sources of sand and gravel. However, as northern California contains an overabundance of suitable materials, particularly in courses of modern streams, it was felt that these formations should be omitted from this inventory except where they were exploited commercially.

Selected deposits in the Sacramento Valley which were investigated by the U. S. Bureau of Reclamation for use in Shasta Dam and other later projects, have been included in the tabulation for the sake of completeness. These deposits were not field checked by the author and in most cases are not shown on the map. The deposits investigated for Shasta Dam are identified by a symbol, †, preceding the name in the tabulation. Data on these deposits were abstracted from Report C-30 of the Bureau of Reclamation mentioned previously. Other deposits examined by the Bureau for later projects are indicated by an asterisk (*) preceding the name.

In using the test results it should be borne in mind that these tests represent only the samples submitted and do not necessarily represent all the material in a given deposit. Test results of the Division of Highways are from material submitted since 1955. Tests performed by the U. S. Bureau of Reclamation, Denver Testing Laboratory in 1938, and other data obtained from that agency are identified in the table by the abbreviation USBR.

Photo 6 (left). Medium-sized plant. Medium capacity plants capable of producing up to 400 tons per haur of washed material are located near the larger papulation centers. The plants are relatively simple, consisting of crushing equipment to reduce aversize gravel, standard vibrating screens, and screw-type sand classifiers. Such plants produce all sizes of washed sand and gravel for use as concrete aggregate and bituminous aggregate.

Photo 7 (below). Small plant. Many small plants capable of producing less than 50 tons an haur aperate near the smaller marketing areas. The demand does nat warrant large expenditures far expensive madern plant equipment; these plants are often crude, simple, screening affairs.

Photo 8. Portable plant. A substantial portian of the totol sond and gravel in northern Califarnia is produced by contractors far city, county, stote or federal ogencies. Portable equipment capable of processing hundreds of tons per hour are set up temporarily to provide on-the-site material. Ordinorily, these plonts, which consist of screens and crushers, operate dry ta produce rood bose.

TABULATION OF SAND AND GRAVEL DEPOSITS IN NORTHERN CALIFORNIA

SAND AND GRAVEL IN CALIFORNIA

INVENTORY OF DEPOSITS

PART A—NORTHERN CALIFORNIA

DEPOSITS				UTILIZATION															
				Fixed Plant Operations					Laboratory Test Data										
										Spec. Gravity		Absorption		Abrasion		Soundness			
Name and Location	Type and Extent	General Features	Rock Types (percent)	Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel	Sand Equiv.	Organic Content
†**Anderson Creek,** Shasta Co., one mile west of Anderson	Stream bed; shallow, narrow (maximum width 0.1 mile), 1 mile long extending upstream from Anderson	Little overburden; maximum size 6″; replenished in flood stage; contains 15% of 3 to 6 inch cobbles	Meta-andesite, slate, sandstone, shale and conglomerate; small amounts of dacite tuff and lava	None					USBR 1938	2.58	2.58					8.1	20.5		
†**Battle Creek,** Shasta-Tehama Co. line, 10 miles east of Cottonwood	Stream bed; scattered bars	No overburden; maximum size 18″; estimated 200,000 cubic yards available	Primarily vesicular dacite and andesite lavas and tuff, and lesser amounts of massive andesite	None					The Denver tests (of USBR) indicate that the physical properties of this material are within the usually accepted limits (in 1938)										
†**Blue Tent Creek,** Tehama Co., 4 miles north of Red Bluff	Stream bed; shallow, narrow (maximum width 0.1 mile), about 4 miles long, extending from Sacramento River upstream	No overburden; maximum size 3″; replenished in flood stage. Estimated 500,000 cubic yards available.	Meta-andesite, shale, sandstone and conglomerate	None					USBR 1938	Satis.	Satis.					8.5	21.8		Satis.
Bear River, Sutter, Yuba Cos., near Wheatland	Stream bed deposit extends from a point 4 miles west of Hway. 99 crossing upstream for about 9 miles. Width ranges from about 500′ west of Hway. 99 to 0.3 mile near head. Depth at widest portion estimated by old dredge operators at 40′.	No overburden. Max. size 6″ diminishes downstream. Derived in part from hydraulic tailings upstream. Sub-rounded gravel	Vein quartz: white...61 gray....15 Meta-volcanic..... 9 Quartzite.. 7 Diorite-gabbro.... 5 Obsidian.. 1 Gneiss.... 1 Slate.....<1 Serpentine<1	No fixed plants. Local source of pit-run material															

Name and Location	Type and Extent	General Features	Rock Types (percent)	Fixed Plant Operations					Laboratory Test Data										
				Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Spec. Gravity		Absorption		Abrasion		Soundness		Sand Equiv.	Organic Content
										Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel		
Butte Creek, tailings, Butte Co., approx. 3 miles east of Chico	Dredge tailings; 18′ thick x 1000-2000′ wide extend for 4 miles along Butte Creek	Little overburden; no replenishment; maximum size 3″; sand in streambed near plant, well-rounded gravel contains Tertiary volcanic rock derived from the Tuscan formation	Greenstone 33 Meta-siliceous sediments (metachert, quartzite) 20 Basalt 16 Andesite 13 Gneissic granite 8 Gabbro 5 Vein quartz 4 Granite 1	Butte Creek Rock Co., P.O. Box 512, Chico Sec. 5, T.21N., R.2E., MDBM. About 3 miles southeast of Chico	Excavate above water table to depths of 15′. Use dragline to load end-dump trucks which haul about 0.5 mile to plant	Primary jaw, secondary cone (2), and tertiary roll crushers, standard vibratory screens, sand screw. Scrubber removes soft, rotten fragments of bedrock which were dredged up with stream bed gravel. Roll crusher manufactures screenings and and crushes plus 1½″.	300 tons per per hour unwashed gravel; 150 tons per hour washed concrete aggregate. Recover some gold over riffles when processing sand	Concrete sand and gravel; bituminous sand and gravel	No. of tests	5	10	5	10	4	4	3	6	3	7
									Range of results	2.59 to 2.64	2.68 to 2.74	2.6 to 5.2	0.9 to 2.1	2.4 to 4.4	20.4 to 21.0	4.3 to 10.9	2.0 to 5.7	90 to 96	Satis.
									Average	2.61	2.72	3.6	1.6	3.5	20.7	7.4	3.5	93	
Cache Creek, North Fork, Lake Co., northeast and east of Clear Lake	Stream bed; extends for 7 miles to north from confluence with main branch and for 3 miles along main branch below this junction; average width 750′. Est. 2 million cubic yards available above summer water table. Gravel bars are also along North Fork in Indian Valley below Hough Springs for about 5 miles with average width of 750′, shallow deposits. Est. 2 million cu. yds. available above summer water table.	No overburden; replenishment in flood stages; maximum size 6″ decreasing progressively downstream to 3″ in both areas; depth of gravel at State Highway 20 crossing is less than 10 feet. Deposits are described in detail in Calif. Jour. Mines and Geology, vol 54, no. 2. Gravels are subrounded and of Coast Ranges derivation.	Graywacke 60-85 Greenstone 6-13 Chert 1-3 Serpentine 1-2 Schist and Gneiss 1-2 Coarse sand is composed of rock particles of same rock types in same general proportions. Non-reactive.	No fixed plant; small screening plants with no washing facilities operate occasionally															
***Campbell Creek,** Tehama Co., about 7 miles east of Vina; tributary of Brush Creek	Stream bed; narrow, about 25 yards wide	No overburden; abundant 1-2 foot boulders reworked from weakly-cemented bouldery terrace deposits	Basalt, and Pyroxene Andesite	None															

DEPOSITS				UTILIZATION															
				Fixed Plant Operations					Laboratory Test Data										
										Spec. Gravity		Absorption		Abrasion		Soundness			
Name and Location	Type and Extent	General Features	Rock Types (percent)	Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel	Sand Equiv.	Organic Content
Cherokee tailings, Butte Co., about 10 miles northeast of Oroville and 2 miles west of Cherokee	Alluvial outwash plain formed by hydraulic debris from Cherokee pit; covers 3 sq. mile area over 15′ deep.	Little or no overburden; dry all year; maximum size 3″, average size 1″; little clay or silt present. Approx. 70 percent sand and about 7 percent plus ¾ inch (USBR).	Sand and gravel consist almost predominantly of quartz and meta-chert	Pentz Gravel, Attn. L. E. Wheelock, Durham, NE¼ Sec. 36, T.21N., R.3E., MDBM. Near Cherokee, off Oro-Pentz road.	Excavate with dragline to depths of 6 to 8′. Haul about 500 feet to plant by truck	Trommel washing screen scalps and wastes plus 1½″, minus 1½″—No. 4 is stockpiled. Sand washed in small screw-type classifier.	Estimate 25 tons/hr.	Plaster sand, concrete sand and gravel	Note: Test made by USBR in 1938 on pit run material show a loss of 30.3% in the Los Angeles Rattler Test.										
Churn Creek, Shasta Co., about 3 miles northeast of Redding	Stream bed, shallow, maximum width 0.1 mile, extends for 2 miles to south of intersection with Hwy. 99	No overburden. Some replenishment in winter.	Meta-andesite, slate, sandstone, shale, and conglomerate; small amounts of dacite tuffs and lava	Riley Trucking Co., P.O. Box 1462, Redding Sec. 18, T.32N., R.4W., MDBM. About 3 miles northeast of Redding	Excavate with dragline to a clay layer at depth of 5′. Haul by truck ¼ mile to plant	Small crushing and screening plant; minus ¾″ gravel is screened and washed.	Estimate less than 25 tons per hour.	Concrete sand and gravel, fill.	Note: Tests made by USBR on pit run material from Churn Creek in 1938 gave following results:			3.0	2.3			23.2	42.0		
Clear Creek, Shasta Co., about 5 miles south of Redding	Flood plain; on north side of Clear Creek west of junction with the Sacramento River; area is 1500′ long × 900′ wide. Dredge tailings extend for several miles along north side of Clear Creek, commencing about 1 mile west of Hway. 99. Tailings are about ½ mile wide and up to 12′ thick. Farther upstream at French Gulch tailings are 2 miles long and ¼ mile wide	No overburden; replenished in flood stage; average size gravel in cobble range, some boulders up to 16″ present.	Granitic 24 Sandstone 24 Quartzite 14 Conglomerate 8 Meta-volcanic 7 Schist and gneiss 7 Gabbroic 4 Acid volcanic 4 Vein quartz 3 Slate 3 Chert 2	Oaks Sand Gravel and Cem. Prod. Co., P.O. Box 1847, Redding SW¼ Sec. 30, T. 31 N., R. 4 W., MDBM.; 5 miles south of Redding, east of Hway. 99 No production in the dredge tailings	Excavate with dragline below water table to layer of boulders at 10′ depth. Haul by truck about 1000′ to plant	Plus 3″ is scalped and crushed in primary gyratory; jaw and cone crushers; sand classifiers. Manufacture sand by crushing ¼″ gravel in 4 × 5′ ball mill. Minus ¼″ is jigged for gold recovery. Wash over standard vibratory screens	Estimated 100 tons per hour	Concrete sand and gravel, bituminous sand and gravel, plaster sand, road base, fill	No. of tests	6	15	7	15	5	5	4	10	5	7
									Range of results	2.59 to 2.64	2.61 to 2.70	1.7 to 2.2	1.1 to 2.5	4.8 to 6.2	25.0 to 27.6	3.5 to 4.7	2.1 to 7.5	84 to 90	
									Average	2.60	2.64	1.9	1.7	5.7	26.5	3.9	5.2	87	Satis.

Name and Location	Type and Extent	General Features	Rock Types (percent)	Fixed Plant Operations					Laboratory Test Data											
				Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Spec. Gravity		Absorption		Abresion		Soundness		Sand Equiv.	Organic Content
										Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel		
Cortina Creek, Colusa Co., about 8 miles southwest of Williams	Stream bed, shallow, narrow about 75′ wide, extends for about 3 miles in foothill area (USBR)	No overburden, replenished in flood stage, estimate 10% plus 1½″ (USBR)	Rock types reworked from Tehama formation: graywacke, greenstone, chert	Goforth Bros., 227 5th St., Williams Sec. 13, T. 15 N., R. 3 W. MDBM in Williams	Excavate with scoop mobile and truck about 8 miles to plant in Williams. Also have pit on Sand Creek.	Plus 1½″ is scalped and wasted. Wash over standard vibratory screens	50 tons per hour	Concrete sand and gravel	No. of tests	3	6	3	6	5	5	3	6	3	3
									Range of results	2.59 to 2.62	2.63 to 2.71	1.3 to 1.4	0.7 to 1.7	5.2 to 5.8	25.2 to 26.8	3.0 to 3.8	0.4 to 1.7	91 to 93	
									Average	2.61	2.66	1.4	1.3	5.5	25.9	3.5	1.2	91	Satis.
†**Cottonwood Creek,** Shasta Co., at Cottonwood along County line	Stream bed, shallow, narrow, extends for about 3 miles from Cottonwood east to the Sacramento River.	Little or no overburden, replenished during flood stage. Maximum size 3″. Estimate 6 million cubic yards available (1938)	Chiefly meta-andesite and slate, with basalt, andesite, granite, diorite, chert, shale, sandstone, limestone, rhyolite, and conglomerate	None															
Davis Creek, Mendocino Co., 3 miles east of Willits, tributary to the Eel River	Stream bed, shallow, narrow, average width 300′, one mile long.	No overburden, replenished in flood stage, maximum size 8″, subrounded gravel	Graywacke 80 Chert.....10 Greenstone 8 Serpentine<1 Schist....<1	Willits Ready Mix, Route 1, Box 114, Willits, SE¼ Sec. 17, T.18N., R.13 W., MDBM, 3 miles east of Willits	Excavate with dragline to depth of 5′. Stockpile during high water	Primary jaw crusher, standard vibratory screens, sand screw	400 cubic yards in 8 hours	Concrete sand and gravel	Test Results	2.58	2.65	2.6	1.9 1.6	7.0	31.4	12.6	9.4 15.4	77	Satis.
				Pete Persico, 368 McKinley, P.O. Box 516, Willits SE¼ Sec. 18, T.18N., R.13 W., MDBM, 2 miles east of Willits		Roll crusher and standard vibratory screens	Estimate 25 tons per hour	Bituminous sand and gravel											
***Deer Creek,** Tehama Co., about 2 miles north of Vina	Stream bed, gravelly, about 100 yards wide; 1¼ miles upstream from intersection with Hway. 99 is narrow, shallow and bouldery	No overburden, maximum size 5″.		None															
†**Dibble Creek,** Tehama Co., about 2 miles north of Red Bluff	Stream bed, shallow, narrow, and long, extends upstream from confluence with Sacramento River about 2 miles.	No overburden, maximum size 4″ diminishing to 3″ near mouth, estimate 1,500,000 cubic yards	Meta-andesite and shale, sandstone, and conglomerate.	None															

DEPOSITS				UTILIZATION																
				Fixed Plant Operations					Laboratory Test Data											
										Spec. Gravity		Absorption		Abrasion		Soundness			
Name and Location	Type and Extent	General Features	Rock Types (percent)	Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel	Sand Equiv.	Organic Content
Dry Creek, Butte Co., northwest of Oroville, between Chico and Oroville	Stream bed, fine gravel in stream bed for about 3 miles below Cherokee tailings; sand for additional 2 miles downstream, shallow and narrow, 300'-500' wide	Little or no overburden, replenished in flood stage, maximum size 1½"	Dry Creek is reworking hydraulic tailings from the Cherokee mine upstream. Same rock types as in Cherokee tailings-quartz and metachert	Marler and Sons Rock Co., 4640 Virginia Ave., Oroville NE¼ Sec. 7, T.20N., R.3E., MDBM. Nine miles NW of Oroville	Excavate with dragline to depths of 3' to 4'	Small screening plant consisting of gas-powered vibrating screen.	25 cubic yards per hour	Plaster, stucco, and concrete sand	No. of tests	4		3				2		1	2
									Range in tests	2.60 to 2.74						1.9 to 2.1			Satis.
									Average	2.64		0.6						92	
				Baldwin Const. Co., Oroville NW¼ Sec. 3, T.20N., R.3E. MDBM	Truck to plant in Oroville (under Feather River)					2.61		0.8				2.9		92	Satis.
†**Dry Creek**, Shasta Co., about 6 miles northeast of Anderson	Stream bed, shallow, narrow, and long	Approximately 7 million cubic yards with 10" maximum available; plus 6" small.	Considerable meta-andesite and slate with a high percentage of sandstone, shale and conglomerate, and small amounts of dacite tuffs and lava.	None					USBR							15.6	17.9		
Eel River, Humboldt Co., vicinity Fortuna	Stream bed below confluence with Van Duzen River; bars upstream between Alton and Garberville. Stream bed deposit extends for about 8 miles inland from the ocean, width ranges from ¼ to ½ mile deep.	Little or no overburden; replenished in flood stage; maximum size 3". Subangular to subrounded gravel	Graywacke 71 Chert 15 Vein quartz 9 Greenstone 4 Conglomerate 1 Granitic <1	McWhorter and Dougherty, P.O. Box 542, Fortuna Center Sec. 34. T.2N., R.1W., HBM. One-half mile west of Fortuna	Excavate with crane-mounted dragline	Screening plant only. Wash over standard vibratory screens.	About 300 tons per hour	Concrete, sand and gravel	No. of tests	10	11	10	15	8	8	6	11	9	10
									Range of results	2.61 to 2.64	2.62 to 2.69	0.8 to 1.3	1.1 to 1.4	4.2 to 5.2	21.4 to 24.2	2.1 to 3.2	0.8 to 6.3	88 to 95	
									Average	2.63	2.65	1.2	1.3	4.7	22.8	2.6	3.6	93	Satis.
				Rio Dell Gravel Co. uses skip loader to obtain "creek-run" gravel for local use.															
				Fortuna Sand and Gravel Co., P.O. Box 175, Fortuna produces sand and gravel for concrete aggregate from a bar near Phillipsville. Use a portable crushing and screening plant with a capacity of about 100 tons per hour.															
				City of Eureka has a portable crushing and screening plant near Ferndale.															
***Elder Creek**, Tehama Co., northeast of Los Molinos	Stream bed, about 100 yds. wide	Little or no overburden, maximum size 3", estimate 5% plus 1½". Similar to Thomes Creek.		None															

Name and Location	Type and Extent	General Features	Rock Types (percent)	Fixed Plant Operations					Laboratory Test Data											
				Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Spec. Gravity		Absorption		Abrasion		Soundness		Sand Equiv.	Organic Content
										Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel		
Feather River, Butte and Sutter Cos., south of Oroville	Stream bed, east of Gridley contains large gravel bar about 500 yds. long × 500 yds. wide. Predominantly sandy bars below Gridley	No overburden, replenished in flood stage, no cobbles or boulders present	Similar to tailings below	Mathews Ready-Mix, Inc., Rt. 1, Box 23, Gridley SW¼ Sec. 33, T.18N., R.3E., MDBM, 3 miles east of Gridley on east bank of river	Excavate with dragline. Haul in trucks to nearby plant. Obtain cobbles and boulders to crush for use as road base from dredge tailings on west side of river	Primary jaw, secondary cone crushers, screw-type sand classifier, standard vibratory screens	50 tons per hour.	Concrete sand and gravel, plaster sand	No. of tests	5	7	5	5	4	4	4	6	5	5
									Range of results	2.65 to 2.73	2.80 to 2.86	1.2 to 2.1	0.5 to 1.9	2.6 to 3.4	13.6 to 16.4	1.4 to 2.6	0.1 to 1.0	82 to 98	
									Average	2.60	2.83	1.7	0.9	3.0	15.1	2.2	0.6	92	Satis.
	Dredge tailings, along Feather R. from Oroville to E. Biggs; 1-3 miles wide × 10 miles long × 18′ thick	No overburden, dry, pebbles and cobbles 12′ to 18′ deep overlie sand	Amphibolite 43 Diorite 16 Greenstone 15 Granitic 12 Quartzite 9 Basalt 2 Andesite 1 Serpentine <1 (USBR)	Henry J. Kaiser Co., Adelaide Plant, P.O. Box 151, Oroville SE¼ Sec. 25, T.19N., R.3E, MDBM, 4 miles south of Oroville	Excavate with dragline. Load trucks for haul to plant nearby	Plus 1½″, scalped off on revolving trommel screen is crushed in cone crushers (2) and washed over standard vibratory screens.	150 tons per hour	Crushed gravel for railroad ballast	No. of tests		8		7	2	4		7		
									Range of results		2.83 to 2.90		0.6 to 1.1	2.6 and 3.0	13.8 to 15.6		0.6 to 1.5		
									Average		2.87		0.7	2.8	14.3		1.3		
				Baldwin Contr. Co., P.O. Box 311, Marysville, NW¼ Sec. 18, T.19N., R.4E, MDBM on Robertson Rd. in Oroville	Obtain sand from pit on Dry Creek off Clark Rd. (See Dry Creek, Butte Co.)	Small portable crushing unit, standard vibratory screens	Estimate 25 to 50 tons per hour	Concrete sand and gravel	No. of tests	2	4	2	4	2	2	2	4	2	2
									Range of results	2.60 to 2.61	2.87 to 2.89	0.7 to 0.7	0.6 to 0.8	3.2 to 2.4	16.8 to 13.4	2.0 to 2.0	0.4 to 1.8	96 to 93	
									Average	2.61	2.88	0.7	0.7	2.8	15.1	2.0	1.1	95	Satis.
Garcia River, Mendocino Co., NE of Pt. Arena	Stream bed, long, narrow, shallow. Extends for 8 miles up stream from intersection with Hwy. 1, average width 250′.	No overburden, replenished in flood stage; maximum size gravel 4″ near plant; average gravel size 2″ is sub-angular to sub-rounded	Graywacke 96 Greenstone 3 Chert 1 Vein quartz <1	Ellison Gravel Co., 112 Harold St., Fort Bragg Sec. 31, T.13 N., R.16W., MDBM. Operation 2 miles north of Pt. Arena; 3/5 mile E. of Hwy. 1	Excavate with dragline to 3′ depth. Haul in end dump truck a few hundred feet to plant	Primary and secondary jaw crushers, standard vibratory screens. Wash sand over screens	Estimate 100 yards a day	Concrete sand and gravel	Test results	2.52	2.56 2.57	3.5	3.0 2.5	5.4 5.4	24.4 24.4	13.8	16.7 14.9	91	Satis.
Greenhorn Creek, Siskiyou Co., south and west of Yreka	Dredge tailings, along Greenhorn Creek for approx. 3 miles upstream from Hwy. 99, 15′ thick and 200-1,000′ wide	Little overburden, dry; gravel are angular to sub-angular	Diabase 45 Greenstone 19 Chert 13 Vein Quartz 9 Mica schist 5 Basalt 3 Phyllite 3 Rhyolite 1 Quartzite 1 Serpentine 1	Albert Young, 112 4th St., Yreka SW¼ Sec. 26, T.45N., R. 7W., MDBM. One-half mile E of Hwy 99 in Yreka	Excavate gravel with tractor shovel Haul by truck approx. 3 miles to plant. Pit in SW¼ Sec. 29. Obtain sand from Whitney Creek	Primary jaw, secondary jaw and roll crushers, standard vibratory screens	75 tons per hour	Concrete sand and gravel; Bituminous sand and gravel	No. of tests	4	6	4	6	4	4	4	6	4	4
									Range of tests	2.58 to 2.59	2.73 to 2.83	1.2 to 3.3	1.3 to 2.2	3.6 to 5.8	19.8 to 24.6	2.0 to 5.7	3.3 to 12.6	89 to 98	
									Average	2.59	2.77	2.1	1.8	4.7	22.1	3.2	6.5	93	Satis.

DEPOSITS				UTILIZATION															
				Fixed Plant Operations					Laboratory Test Data										
										Spec. Gravity		Absorption		Abrasion		Soundness			
Name and Location	Type and Extent	General Features	Rock Types (percent)	Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel	Sand Equiv.	Organic Conten
†**Joyland Creek,** Tehama Co., approx. 5 miles north of Red Bluff	Stream bed, shallow, narrow, long, about 5′ deep	No overburden, maximum size 3″, approx. 500,000 cu. yds. available	Meta-andesite with shale, sandstone and conglomerate	None															
Kelsey Creek, Lake Co., between Kelseyville and Clear Lake	Stream bed, extends for about 6 miles from Clear Lake south, average width 300′, near Kelseyville over 35′ deep—shallower to north near lake.	No overburden, replenished in flood stage, maximum size 4″, little plus 1½″, subangular to subrounded gravel	Graywacke 72 Chert 7 Greenstone 7 Serpentine 6 Volcanic rock: 6 Glassy 1 Other 5 Vein quartz 2 Schist <1	F. M. Frazell, P.O. Box 914, Lakeport SE¼ Sec. 10, T.13N., R9 W., MDBM. ½ mile N. of Kelseyville	Excavate with dragline. Haul in truck to nearby plant	Roll crusher for oversize, 4-deck vibratory screens, Dorr sand classifier	250-400 tons per day	Concrete sand and gravel	No. of tests	3	8	3	8	2	2	2	6	5	5
									Range of results	2.55 to 2.56	2.57 to 2.65	3.5 to 3.9	1.5 to 3.4	6.2 to 6.4	24.4 to 26.8	13.2 to 8.2	8.1 to 14.2	79 to 90	
									Average	2.55	2.61	3.7	2.2	6.3	25.6	10.7	10.6	80	Satis.
				Lange Bros., P.O. Box 66, Lakeport SE¼ Sec. 3, T.13N, R.9W., MDBM 1¼ miles N. of Kelseyville	Excavate with dragline. Haul by truck to nearby plant	Small plant; crusher, vibratory screens, sand screw	Estimate 25 tons per hour	Concrete sand and gravel	No. of tests	5	11	5	12	8	7	6	14	5	4
									Range of results	2.57 to 2.60	2.62 to 2.65	2.9 to 3.3	1.3 to 2.3	5.2 to 6.2	22.8 to 26.6	6.0 to 10.0	2.8 to 12.7	85 to 96	
									Average	2.59	2.64	3.1	1.7	5.7	25.7	8.8	8.6	90	Satis.
Klamath River, tributaries **Scott** and **Trinity Rivers,** Del Norte, Trinity and Siskiyou Cos.	Gravelly bars occur along the main branch of the Klamath R. from the town of Klamath south for about 20 miles. Bars range in width from ¼ to ½ mile near the ocean and diminish in size upstream.	No overburden, replenished in flood stage; Maximum size 3″ near Klamath; subangular to subrounded gravel	Graywacke 36 Greenstone 24 Granitic 13 Serpentinized peridotite 9 Schist 6 Quartzite 4 Chert 3 Hornfels 3 Vein quartz 2	No fixed plant. Simpson Lumber Co. uses creek run for own roads near Klamath; Schoonmaker (See below) uses portable plant on bars at Happy Camp, and Seid.															
	The Trinity River contains significant bars at Weitchpec and Hoopa, and hydraulic mine tailings at Weaverville, Lewiston, and Douglas City (Reading Bar). This bar is at the confluence of the tributary Reading Ck. and is approx. ¾ mile long × 500-1,000′ wide × 25′ thick.	Reading Bar—has no overburden, dry, size ranges from sand to 2′ boulders, subangular to subrounded gravel	Schist 32 Gabbro 22 Granite 15 Gneiss 11 Greenstone 10 Vein quartz 3 Quartzite 3 Serpentine 1 Conglomerate 1	Trinity Sand and Gravel Co., Weaverville. Center Sec. 12, T. 32N., R.10W, MDBM. One mile southwest of Douglas City	Excavate tailings with front end loader. Haul in end-dump trucks short distance to plant	Crushers, standard vibratory screens, screw-type sand classifier	Estimated 200-300 cubic yards per day	Concrete sand and gravel	No. of tests	5	8	5	8	3	3	6	6	4	5
									Range of results	2.69 to 2.75	2.76 to 2.85	1.7 to 2.2	0.8 to 1.3	4.8 to 6.4	21.8 to 29.4	2.3 to 4.9	1.2 to 5.2	88 to 96	
									Average	2.71	2.79	1.9	1.1	5.4	26.5	3.9	3.0	92	Satis.
				Portions of the dredge tailings will be utilized by the U. S. Bureau of Reclamation in the construction of the large earthfill Trinity Dam.															

Name and Location	Type and Extent	General Features	Rock Types (percent)	Fixed Plant Operations					Laboratory Test Data										
				Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Spec. Gravity		Absorption		Abrasion		Soundness		Sand Equiv.	Organic Content
										Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel		
	The Scott River contains sand and gravel in Scott Valley in the stream bed and as dredge tailings			Eric Schoonmaker, Rt. 1, Box 356, Yreka has screening plant in Scott Valley					No. of tests	6	6	6	6	4	4	3	4	6	5
									Range of results	2.57 to 2.64	2.61 to 2.67	2.0 to 3.1	1.3 to 2.0	5.6 to 7.2	25.6 to 29.8	3.4 to 5.1	3.7 to 8.9	81 to 91	
									Average	2.59	2.64	2.5	1.6	6.3	27.5	4.3	5.3	88	Satis.
***Lindo Channel,** Butte Co., northeast of Chico	Stream bed, about ½ mile long, 100 yards wide	Estimate 50% plus 1½", maximum size 6"; at least 100,000 cu. yds. available (1950), well-rounded gravel	Tertiary volcanic: Quaternary basalt 17 Tuscan fm., pyroxene basalt and andesite porphyry 43 Metamorphic: Greenstone, quartzite, amphibolite 36 Slate and phyllite 2 Granite 1 Gabbro 1	No fixed plant															
†Long Gulch, Butte Co., 7 miles north of Los Molinos	Stream bed, shallow, narrow. Deposit in NE ¼ Sec. 4, T.26 N., R.2W. MDBM	No overburden, maximum size 9", approx. 2 million cu. yds available	Primarily vesicular dacite and andesite lava and tuff and lesser amounts of massive andesite	None					USBR 1938						33.9	13.4	8.8		
Mad River, Humboldt Co., north- and west of Arcata	Stream bed and bars extend upstream from Hway. 101 for about 12 miles; average width 500'.	Little or no overburden, replenished in flood stage; maximum size 4" at Hway. 101, to 8" three miles upstream. Sticks and fine mud veneer deposits after floods. Gravel is sub-angular to sub-rounded	Graywacke 73 Greenstone 13 Chert 7 Vein quartz 4 Schist 2 Limestone 1	Eureka Sand and Gravel Co., Inc. 1955 Hilfiker Ave., Eureka. NW¼ Sec. 16, T.6N., R.1E., HBM 2 miles north of Arcata	Excavate to 4' depth with dragline. Avoid clay areas by selective mining.	Standard vibratory screens	400 tons per hour	Concrete sand and gravel											
				Mercer Frazer Co., Inc. 2nd and Commercial Sts., Eureka. SW¼ Sec. 14, T.6N., R.1E., HBM 4 miles NE of Arcata	Excavate to 8-10' depths with dragline. Truck to nearby plant	Primary jaw, secondary roll crushers; standard vibratory screens, screw-type sand classifier	1000 cubic yards of concrete aggregate per 8 hours	Concrete sand and gravel; bituminous sand and gravel	No. of tests	6	6	6	10	5	5	5	10	4	6
									Range of results	2.63 to 2.69	2.67 to 2.70	1.2 to 1.9	1.0 to 1.5	4.6 to 5.2	21.6 to 24.8	4.0 to 5.5	2.9 to 8.6	83 to 93	
									Average	2.65	2.68	1.6	1.3	4.8	23.3	4.7	6.1	85	Satis.

DEPOSITS				UTILIZATION																	
				Fixed Plant Operations					Laboratory Test Data												
										Spec. Gravity		Absorption		Abrasion		Soundness				
Name and Location	Type and Extent	General Features	Rock Types (percent)	Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel	Sand Equiv.	Organic Content
				Arthur B. Siri, & Inc., 1357 Cleveland St., Santa Rosa NW¼ Sec. 16, T.6N., R.1E., HBM. 2 miles north of Arcata	Excavate with dragline. Truck to nearby plant	Revolving washing trommel removes mud, clay and sticks. Primary jaw, secondary roll crushers, standard vibratory screens, screw-type sand classifier	1000 tons per 8 hours	Concrete sand and gravel; bituminous sand and gravel												
Middle Creek, Lake Co., northwest end of Clear Lake near Upper Lake	Stream bed, extends for about 3 miles upstream from a point 2 miles north of Upper Lake; average width 0.2 mile	No overburden; replenished in flood stage; little plus 3″, subrounded to subangular gravel	Graywacke 85 Chert 8 Greenstone 5 Vein quartz 2 (USBR)	No fixed plant. Source of road base materials for highway contractors who use portable plants															
†**Mill Creek**, Tehama Co., 2½ miles north of Los Molinos at Hway 99E.	Stream bed, shallow, narrow	No overburden, maximum gravel 3″. Est. 2 million cubic yards	Primarily vesicular dacite and andesite lava and fuff with lesser amounts of massive andesite	None					USBR 1938							8.5	3.8		
Mt. Shasta Pit, Siskiyou Co., near town of Mt. Shasta	Fluvial-glacial out-wash on southwest flank of Mt. Shasta. Covers about one sq. mile area; over 50′ deep.	Dry pit, angular fragments up to 3′, stratified with gravel layers 1-2′ thick, and 6″ silt layers	Volcanic rock fragments, predominantly andesite	Mt. Shasta Gravel Co., P.O. Box 836, Mt. Shasta SW¼ Sec. 5, T.40N., R.4 W., MDBM. 2 mi. N. of Mt. Shasta, west of Hway 99	Excavate from pit 30′ deep × 50′ wide × several hundred feet long with shovel. Truck to plant nearby	Primary jaw, two roll crushers, standard vibratory screens, sand drag	300 tons per hour	Concrete sand and gravel	No. of tests	8	12	8	10	5	4	4	8	7	7
									Range of results	2.41 to 2.49	2.13 to 2.30	3.6 to 5.9	4.2 to 8.9	7.2 to 10.0	33.6 to 40.2	3.1 to 4.3	0.6 to 12.5	81 to 98	
									Average	2.45	2.24	4.8	6.1	8.5	37.9	4.0	5.3	87	Satis.
†*Pine Creek, Butte Co., 13 miles south of Los Molinos at Hway 99E	Stream bed, shallow, narrow, average width 25 yds., long.	Considerable overburden, maximum size 5″	Exclusively volcanic rock types—much andesite	None					USBR 1938							8.3	11.5		

Name and Location	Type and Extent	General Features	Rock Types (percent)	Fixed Plant Operations: Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products	Laboratory Test Data	Spec. Gravity: Sand	Spec. Gravity: Gravel	Absorption: Sand	Absorption: Gravel	Abrasion: 100 rev.	Abrasion: 500 rev.	Soundness: Sand	Soundness: Gravel	Sand Equiv.	Organic Content
Pit River, Modoc Co., near Alturas	Stream terrace, adjacent Pit R.; irregular area several square miles in extent; depth shallow (10′)	Considerable overburden, much clay and silt present; dry; lenses of gravel are irregular and lenticular; maximum size 8″, sub-angular to sub-rounded gravel	Andesite-basalt 63 Rhyolite-dacite 33 Obsidian 3 Tuff <1 Vein quartz <1	Moyer Gravel Co., P.O. Box 25, Alturas SE¼ Sec. 5, T.42N., R.13 E. MDBM. 2 miles NE of Alturas	Excavate in dry pits with scrapers, bulldozers and shovels to 10′ depth. Truck approx. 0.5 miles to plant	Revolving trommel, 2 crushers, standard vibratory screens, sand drag.	About 200 tons per day	Concrete sand and gravel; bituminous sand and gravel; road base	No. of tests	5	8	5	8	3	3	4	7	7	4
									Range of results	2.62 to 2.74	2.62 to 2.69	2.5 to 3.1	1.2 to 2.3	4.6 to 5.6	22.6 to 26.3	3.8 to 9.4	2.8 to 7.7	67 to 90	
									Average	2.67	2.67	2.9	1.7	5.0	23.8	7.3	5.1	79	Satis.
Putah Creek, Lake Co., near Middletown	Stream bed deposits along Putah Creek 0.4 mile north of Middletown in Collyami Valley approx. 2½ miles long × 0.1 mile wide; and in Coyote Valley 3½ miles NE of Middletown, 2 miles long × 250-500′ wide.	No overburden, replenished in floods, max. size 6″. Sub-rounded to sub-angular. Sand content averages 27-37% in pit run.	Graywacke 51 Greenstone 16 Serpentine 11 Tertiary volcanic: Andesitic 8 Rhyolitic 3 Schist 5 Vein quartz 3 Chert 2 Gabbro 1 Shale <1	None					Note: Following test results are on material processed by Camp Rock Co. prior to 1957. Camp Rock Co. was not active in 1958 or 1959.										
									No. of tests	8	10	2	6	6	6	10	10		
									Range of results	2.51 to 2.77	2.57 to 2.76	4.7 to 4.8	1.5 to 2.9	5.0 to 6.2	23.2 to 25.7	11.3 to 26.5	3.5 to 14.0		
									Average	2.64	2.66	4.8	2.3	5.5	24.6	19.2	8.2		
***Redbank Creek,** Tehama Co., 3 miles south of Red Bluff	Stream bed, extensive	No overburden, little plus 1½″, estimate 100,000 cubic yards; sub-angular gravel	Chert 43 Vein quartz 14 Greenstone 13 Graywacke 11 Quartzite 10 Schist 4 Amphibolite 3	None															
Russian River, Mendocino Co., between Ukiah and Hopland	Stream bed, extends from a point approx. 10 miles north of Ukiah to Hopland, a distance of about 20 miles; average width 500′, ranges from 0.1 to 0.3 mile in width.	No overburden, replenishment somewhat reduced after completion of Coyote Dam on East Fork NE of Ukiah; sub-angular to sub-rounded gravel	Graywacke 67 Greenstone 15 Chert 9 Vein quartz 4 Serpentine 3 Schist 2	Arthur B. Siri, Inc., 1357 Cleveland St., Santa Rosa. NW¼ Sec. 33, T.16N., R.12 W., MDBM. 4 miles north of Ukiah, 1 mile N. of junction with East Fork	Excavate with dragline to 8′ depth. Haul in truck to nearby plant. Replenished in flood stages	Primary jaw, secondary cone crushers, standard vibratory screens, screw-type sand classifier	100 tons per hour.	Bituminous sand and gravel											
				Ford Gravel Co., P.O. Box 217, Ukiah. SW¼ Sec. 9, T.15N., R.12 W., MDBM. NE of Ukiah on Ford Road	Excavate with dragline. Truck to nearby plant. Stockpile during low water	Single cone crusher, standard vibratory screens	125 tons per hour	Concrete sand and gravel	No. of tests	9	14	9	14	8	8	6	12	8	10
									Range of results	2.60 to 2.63	2.65 to 2.71	1.8 to 2.3	1.4 to 2.2	5.4 to 6.8	25.6 to 29.4	6.8 to 12.8	1.8 to 16.8	79 to 94	
									Average	2.61	2.68	2.1	1.8	6.2	27.9	9.8	9.9	87	Satis.

DEPOSITS				UTILIZATION															
				Fixed Plant Operations					Laboratory Test Data										
										Spec. Gravity		Absorption		Abrasion		Soundness			
Name and Location	Type and Extent	General Features	Rock Types (percent)	Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel	Sand Equiv.	Organic Content
				Ukiah Gravel and Cement Co., Inc., P.O. Box 187, Ukiah. NE¼ Sec. 28, T.15 N., R.12W., MDBM, approx. 1 mile southeast of Ukiah on Talmage Road	Excavate from bar with dragline. Work to water level 2 months in low stage. Bar replenished after floods	Cone crusher, trommel screen, screw-type sand classifier	100 tons per hour	Concrete sand and gravel	No. of tests	2	4	2	4	2	2	2	4	2	2
									Range of results	2.62 to 2.69	2.66 to 2.67	1.9 to 2.1	1.6 to 1.9	5.9 to 6.2	26.8 to 27.4	9.1 to 10.5	10.7 to 16.1	92 to 93	
									Average	2.65	2.67	2.0	1.7	6.0	27.1	9.8	13.3	93	Satis.
Sacramento River, Shasta Co., vicinity Redding	Bars and flood plain deposits extend from 2 miles west of Redding for about 15 miles south, and up to ¼ mile wide along the Sacramento River.	Little to no overburden. No replenishment. Maximum size 20", abundant 8-10" cobbles that increase in size with depth. Deficient in sand. Well-rounded gravel.	Metavolcanic 35 Diorite-gabbro 26 Silicified sandstone 14 Hornfels 12 Tertiary volcanic: Andesite 7 Basalt 2 Chert 2 Shale 2	Redding Sand and Gravel Co., P.O. Box 741, Redding. East end of Butte St., E½ Sec. 31, T.32 N., R.4W., MDBM.	Excavate from flood plain to 15' depth with dragline. Haul by truck to nearby plant. Dig to layer of large boulders max. size 12". USBR in 1938 estimated 20 million cubic yards available. Used in Shasta Dam.	Primary jaw, secondary cone, tertiary roll crushers. Roll manufactures fines for bituminous mix. Wash over standard vibratory screens, screw-type sand classifier.	125 tons per hour	Concrete sand and gravel; bituminous sand and gravel	No. of tests	3	6	3	6	3	3	4	6	2	3
									Range of results	2.60 to 2.65	2.67 to 2.77	2.4 to 2.9	0.8 to 1.6	3.2 to 3.4	16.2 to 17.2	3.8 to 5.6	1.5 to 8.3	81 87	
									Average	2.66	2.71	2.6	1.1	3.3	16.8	4.5	3.7	84	Satis.
				J. H. Hein Co., P.O. Box 226, Redding. East bank of river, south of Hway 44, SW¼ Sec. 6, T.31N., R. 4W., MDBM.	Excavate from flood plain to 3' depth with dragline. Keep pit flooded by water diversion. Abundant 12-16" boulders, larger (3') below 3' depth. Gravel about 60%. Haul by truck 1 mile to plant.	Primary jaw, secondary cone crushers, roll crusher for fines; standard vibratory screens, Wemco triple screw-type sand classifier.	75-100 tons per hour	Concrete sand and gravel; bituminous sand and gravel	No. of tests	4	4	2	4	2	2	1	2		
									Range of results	2.59 to 2.74	2.68 to 2.77	3.0 1.8	0.8 to 1.1	3.4 3.2	16.0 17.0	3.1	1.3 1.6		
									Average	2.67	2.72	2.4	1.0	3.3	16.5		1.5		

Name and Location	Type and Extent	General Features	Rock Types (percent)	Fixed Plant Operations					Laboratory Test Data										
				Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Spec. Gravity		Absorption		Abrasion		Soundness		Sand Equiv.	Organic Content
										Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel		
				Shea-Kaiser—MK-Macco—Raymond, Whiskeytown. 5 miles south of Redding, NE¼ Sec. 30, T.31N., R.4 W., MDBM.	Excavate with dragline from flood plain at edge of river, across from mouth of Clear Creek. Truck to nearby plant 0.5 mile.	Revolving trommel disaggregates gravel then to triple deck vibrating screen. Plus 2½ inch crushed in jaw and cone crushers. Sand processed over riffles to remove gold, 2 hydraulic classifying tanks, and dewatered in a twin sand screw. Originally designed to supply specification aggregate for USBR Whiskeytown tunnel.	400 tons per hour	Concrete sand and gravel	No. of tests	2	4	2	4	2	2	2	4	2	5
									Range of results	2.61 2.63	2.68 to 2.71	2.4 2.7	1.1 to 1.4	3.1 3.6	16.8 19.0	3.8 3.7	2.3 to 3.3	83 85	
									Average	2.62	2.69	2.6	1.2	3.3	17.9	3.7	2.7	84	Satis.
Sacramento River, Shasta, Tehama Cos., vicinity Anderson and Cottonwood	Stream bars and flood plain deposits along river. Specific deposits examined for Shasta Dam by USBR as follows:		Primarily meta-andesite and slate (includes hornfels, argillite). Also present is basalt, andesite, granite, diorite, volcanic tuff, chert, shale, rhyolite, sandstone, limestone and conglomerate	None															
	Anderson Bench. Flood plain deposit, 3½ miles NE of Anderson	3,000,000 cubic yards available, no overburden																	
	Chadam. Flood plain deposit, 4½ miles SE of Anderson	Estimate 6 million cubic yards, average overburden 1 foot.							USBR 1938						23.8	9.1	14.3		
	Bloody Island. Flood plain deposit, 7 mi. SE of Cottonwood.	Estimated quantity 2 million cubic yards, some overburden.							USBR 1938							5.5	6.0		
	Hatch Ranch Bar. 7 miles SE of Cottonwood	3½ million cubic yards available with no overburden.							USBR 1938						23.1				
	Saron F. C. Bar, 7 miles SE of Cottonwood	2¼ million cubic yards available with no overburden							USBR 1938						21.4				

DEPOSITS				UTILIZATION															
				Fixed Plant Operations					Laboratory Test Data										
										Spec. Gravity		Absorption		Abrasion		Soundness			
Name and Location	Type and Extent	General Features	Rock Types (percent)	Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel	Sand Equiv.	Organic Content
Sacramento River, Tehama Co., at Red Bluff	Stream beds of abandoned sloughs of Sacramento River east of Red Bluff: East and West Sand and and Sampson Sloughs cover an area 0.1-0.3 miles wide and 1¼ miles long.	Some silt overburden, no replenishment, dry all year. Little plus 6″; 30% 1¼-12″; 10% plus 3″. Well-rounded gravel. (USBR estimated 6 million cubic yards in 1938).	Metavolcanic 44 Quartzite, chert 16 Cherty sandstone 16 Hornfels 7 Gabbro-diabase 6 Granitic 5 Vein quartz 2 Franciscan chert 2 Andesite 1 Basalt 1 (USBR)	Red Bluff Sand and Gravel Co., P.O. Box 1847, Redding. One-half mile E. of Red Bluff. NW¼ Sec. 20, T.27 N., R.3W., MDBM. Pit located ½ mile south of US 99	Excavate from dry bed of Sand Slough with dragline. Haul in Euclid end-dump trucks about 1 mile to plant	Primary jaw, secondary cone crushers, additional cone crushes plus 1½″ for bituminous aggregate. Screw-type sand classifier. Standard vibratory screens.	1,000 tons per 8 hours	Concrete sand and gravel; bituminous sand and gravel	No. of tests	5	8	5	8	3	3	4	6	7	4
									Range of results	2.60 to 2.63	2.64 to 2.72	1.0 to 1.7	0.8 to 1.2	2.0 to 3.0	16.6 to 17.2	1.6 to 2.0	0.3 to 1.8	83 to 96	
									Average	2.62	2.66	1.4	1.0	2.9	16.7	1.8	0.9	90	Satis.
				Allen and Reddy Sand and Gravel, P.O. Box 729, Red Bluff SE¼ Sec. 20, T.27N., R. 3W. MDBM.	Excavate from stream bed Sand Slough with dragline	Small portable plant	50 to 75 tons per hour	Concrete sands and gravel	No. of tests	3	6	3	6	3	3	3	6	3	3
									Range of results	2.60 to 2.62	2.61 to 2.67	0.9 to 1.8	0.8 to 1.2	2.6 to 3.2	15.2 to 18.2	1.7 to 2.3	0.2 to 0.8	88 to 94	
									Average	2.61	2.65	1.4	1.1	3.1	17.0	2.0	0.6	90	Satis.
Sacramento River, Tehama, Glenn and Colusa Cos. Between Red Bluff and Princeton	Bars in present channel below Red Bluff, range from ½ to 1 mile in length and average ¼ mile in width. Prominent bars are as follws:	No overburden, replenished in flood stages. Gravel decrease from 6″ maximum at Red Bluff to 3″ at Hamilton City to 1½″ at Princeton. Well-rounded gravel																	
	**Tehama bar* on east bank, south of Los Molinos. Estimate 500,000 cubic yards available without stripping	No overburden, Max. size 8″, esimate 30% plus 1½″. Very well-rounded gravel	Metamorphic: 70 Metavolcanic Meta-chert Hornfels Amphibolite Tertiary volcanic: Basalt 20 Andesite 4 Franciscan chert 3 Granitic 2 Schist and gneiss 1	None															

Name and Location	Type and Extent	General Features	Rock Types (percent)	Fixed Plant Operations					Laboratory Test Data										
				Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Spec. Gravity		Absorption		Abrasion		Soundness		Sand Equiv.	Organic Content
										Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel		
	Tina bar east of Corning. Estimate 1 million cubic yards available	No overburden, max. size 8", estimate 50% plus 1½", about 10% plus 3"		None															
	Hamilton City. Bar on east bank approx. 1 mile long × ¼ mile wide.	No overburden, max. size 3". Replenished in flood stage, well-rounded gravel		Teichert Aggregates, E. First and Verbena Ave., Chico. Pit 9 miles west of Chico below bridge on Hwy. 32, Sec. 21, T.22 N., R.1W., MDBM.	Excavate from bar with dragline to 5' depth. Truck to plant about 1 mile.	4' Nordberg cone, standard vibratory screens.	350 tons per hour of crusher run base	Bituminous sand and gravel; base course	No. of tests		3		3	2	2	1	1	1	1
									Range of results		2.65 to 2.72		0.9 to 1.0	4.8 3.6	22.6 17.1				
									Average		2.62		1.6	4.2	19.9	2.5	1.8	81	Satis.
	Princeton Bar, about 10 miles N of Colusa. Estimate 300,000 cubic yards available above water table.	No overburden, max. size 1½". Replenished in flood stage. Sub-rounded gravel	Tertiary volcanic: Andesite 5, Basalt 1; Coast Range rocks: Chert 8, Graywacke 5, Vein quartz 17; Klamath and N. Sierran rocks: Greenstone 27, Quartzite, hornfels 33, Schist 1, Granite 1, Vein quartz 1 (USBR)	Cortina Rock Products, P.O. Box 357, Colusa. Sec. 12, T.17N., R.2.W., MDBM.	Excavate to water table with front-end loader. Haul to portable plant 3 miles south on Princeton-Colusa road.	Portable plant—contains only vibrating screens	175 tons per hour	Concrete sand and gravel												
***Salt Creek**, Colusa Co., southwest of Arbuckle	Stream bed, long, narrow, shallow, about 0.1 mile wide and about 4 miles long, in foothill area.	Little overburden, replenished in flood. Sub-angular to sub-rounded, derived from Tehama fm.	Graywacke 84, Vein quartz 4, Chert 7, Greenstone 4, Limestone 1 (USBR)	None															
***Sand Creek**, Colusa Co., west of Arbuckle	Stream bed, 75-100 yds. wide × about 3 miles long in foothill area.	No overburden, replenished in flood stage. Max. size 6", few % plus 1½". Sub-angular to sub-rounded gravel. Reworked Tehama formation.	Graywacke 60, Greenstone 17, Chert 12, Vein quartz 10, Carbonate nodules 1 (USBR)	None															
Scott River (see under **Klamath River**)																			

DEPOSITS				UTILIZATION															
				Fixed Plant Operations					Laboratory Test Data										
										Spec. Gravity		Absorption		Abrasion		Soundness			
Name and Location	Type and Extent	General Features	Rock Types (percent)	Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel	Sand Equiv.	Organic Content
*Singer Creek, Tehama Co., east of Vina	Stream bed, about 75 yards wide, 2 miles upstream from US 99.	No overburden, estimate 50% plus 1½"; 6" maximum; well-rounded gravel. Reworked terrace gravel underlying stream bed at shallow depth.	Basaltic 90 Andesitic 10 derived from Tuscan formation (USBR)	None															
Smith River, Del Norte Co., north of Crescent City	Stream bed deposit and individual gravel bars extend for about 8 miles upstream from intersection with Hway 101 near coast. Stream bed is 0.1-0.3 miles wide.	No overburden. Replenished in flood stage. Max. size 12" near mouth of river, deficient in fines. Sub-angular to sub-rounded gravel.	Peridotite 44 Meta-volcanic 40 Granitic 11 Meta-gray-wacke 4 Vein quartz 1	Pelican Bay Constr. Services, Inc., P.O. Box 200, Smith River. About 9 miles NE of Crescent City west of Hway 101 bridge crossing. NE¼ Sec. 11, T.17 N., R.1W., MDBM.	Excavate from stream bed with dragline to 10' depth. Truck to nearby plant. Work 8-10 months until high water.	Primary jaw, secondary roll crushers, standard vibratory screens, screw-type sand classifier	1000 cubic yards per 8 hours	Concrete sand and gravel, bituminous sand and gravel	Note: Following results are tests from an operation that pre-dated Pelican Bay Const. Services. Since then this company has furnished concrete aggregate for the U. S. Army Corps of Engineers for use in breakwater construction										
									No. of tests	5	8	6	8	3	3	3	3	5	4
									Range of results	2.66 to 2.72	2.75 to 2.83	1.2 to 2.3	0.5 to 1.1	2.8 to 6.8	11.2 to 19.6	1.1 to 2.9	0.6 to 1.7	86 to 94	
									Average	2.68	2.80	1.7	0.8	4.1	15.2	1.9	1.0	89	Satis.
Spanish Creek, Plumas Co., NW., of Quincy	Stream bed deposit extends for about 2½ miles upstream from intersection with Hway 40A in Quincy. Average width about 500'. Test drilling by Dept. of Water Resources indicate gravel to 60' depth	No overburden. Replenished in flood stage. Max. size near plant is 12" (with abundant 3-6" cobbles) and diminishes rapidly downstream. Source of most of gravel is debris from hydraulic mining near Spanish Ranch. Sub-angular to sub-rounded gravel.	Vein quartz 27 Quartzite 25 Quartz mica-schist 18 Meta-chert 15 Gneiss 6 Meta-volcanic 4 Granitic 3 Serpentine 1	Bellamy Corp., Quincy, Approx. 2.3 miles west of Quincy off Bucks Lake Road. NE¼ Sec. 17, T.24 N., R.9E., MDBM	Excavate in narrow trenches 30' long × 10' wide × 6' deep with dragline. Stockpile to drain. Load truck with front end loader for 0.1 mile haul to plant.	Primary jaw, cone crushers; Cedar Rapids vibrating screens; Wemco sand screw.	200-300 tons per 7 hours	Concrete sand and gravel, road base												
									No. of tests	5	10	5	5	5	5	5	8	8	4
				Plumas Redi-mix operates a small portable crushing plant near Hway 40A to produce aggregate for own ready mix operation.					Range of results	2.52 to 2.60	2.57 to 2.60	1.6 to 3.0	1.2 to 1.8	7.6 to 10.8	36.4 to 40.8	3.6 to 4.8	1.4 to 3.9	80 to 94	
									Average	2.57	2.58	2.4	1.5	9.1	38.4	4.3	2.5	88	Satis.
				Quincy Ready Mix operates a small screening plant downstream from Plumas Readi-mix to obtain aggregate for own use in ready-mix concrete.															

Name and Location	Type and Extent	General Features	Rock Types (percent)	Fixed Plant Operations: Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products	Laboratory Test Data	Spec. Gravity: Sand	Spec. Gravity: Gravel	Absorption: Sand	Absorption: Gravel	Abrasion: 100 rev.	Abrasion: 500 rev.	Soundness: Sand	Soundness: Gravel	Sand Equiv.	Organic Content
†Stillwater Creek, Shasta Co., about 6 miles SE of Redding	Stream bed, shallow, narrow, long.	No overburden. Estimate 6 million cu. yds. available	Considerable amount of meta-andesite and slate—high percentage of sandstone, shale, and conglomerate; and small amounts of dacite tuff and lava.	None					USBR 1938							14.7	31.2		
Stony Creek, Glenn Co., near Orland	Stream bed deposit extends for about 20 miles upstream from confluence with Sacramento River. Width ranges from 0.1-0.5 mile, average 0.2 mile.	No overburden. Replenished in flood stage. Max. size near Orland 6", finer downstream; little plus 1½" six miles east of Orland. Sub-angular to sub-rounded gravel.	Graywacke 37 Vein quartz 32 Greenstone 23 Chert 4 Schist & gneiss 3 Serpentine 1 (USBR)	Orland Sand and Gravel Co., P.O. Box 765, Orland. NW¼ Sec. 15, T.22N., R3W. MDBM. ½ mile N. of Orland. East of Hway 99.	Excavate with dragline to 4-6' depths below water table. Truck to nearby plant	Primary jaw, secondary cone crushers, standard vibratory screens, screw-type sand classifier	150 tons per hour	Concrete sand and gravel, plaster sand	No. of tests	5	8	5	8	4	4	5	8	5	5
									Range of results	2.59 to 2.65	2.64 to 2.75	0.7 to 1.4	0.8 to 1.7	4.2 to 5.4	21.2 to 27.0	1.2 to 3.7	0.4 to 1.5	91 to 98	
									Average	2.63	2.71	1.1	1.0	4.7	23.5	1.9	1.0	93	Satis.
				Mack Rock and Sand Corp., 2325 Fern Ave., Chico. SW¼ Sec. 22, T.22 N., R.2W. MDBM 6 mi. E. of Orland, 0.2 mile S. of Hway 32 to Chico	Excavate with dragline to depths of 4-6' (to water table). Haul in end dump trucks to nearby plant	Wash over standard vibratory screens; screw-type sand classifier	75-100 tons per hour	Concrete sand and gravel	No. of tests	2	4	2	4	2	2	2	4	2	2
									Range of results	2.61 2.66	2.65 to 2.72	1.2 0.7	0.9 to 1.5	5.0 4.8	23.2 23.6	1.5 0.6	0.7 to 4.1	100 91	
									Average	2.64	2.70	0.9	1.1	4.9	23.4	1.5	2.0	95	Satis.
				The Southern Pacific R.R. Co., excavates sand and gravel for use as railroad ballast from pit at Wyo near Orland Sand and Gravel Co.																
Ten Mile River, Mendocino Co., NE of Fort Bragg	Stream bed deposit extends for about 5 miles upstream from a point 1 mile east of intersection with Hway 1. Average width 250 feet. Fairly shallow, near plant has been excavated to 15' depth.	No overburden. Replenished in flood stage. Little plus 3" gravel near plant; average range 1½-3". Deposit 5' above summer water table. Much wood debris washed in by floods. Larger gravel at depth. Sub-angular to sub-rounded gravel.	Graywacke 88 Greenstone 6 Vein quartz 3 Serpentine 2 Chert 1 Schist <1	E. T. Baxman, Rte. 1, Box 633, Fort Bragg. SE¼ Sec. 26, T.20 N., R.17W., MDBM. Approx. 11 miles north of Fort Bragg, 4 miles east of Hway 1.	Excavate with dragline to 5' depth. Haul in trucks 1 mile to plant. Some stripping required after winter floods.	Wash over triple-deck vibrating screen. Oversize crushed in primary jaw and secondary roll crushers. Sand washed in screw-type classifier.	300-500 cubic yards a day	Concrete sand and gravel; bituminous sand and gravel		2.56	2.58	2.9	2.4	7.6	33.6	15.6	26.4	84	Satis.

DEPOSITS				UTILIZATION															
				Fixed Plant Operations					Laboratory Test Data										
										Spec. Gravity		Absorption		Abrasion		Soundness			
Name and Location	Type and Extent	General Features	Rock Types (percent)	Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel	Sand Equiv.	Organic Content
Thomes Creek, Tehama Co., near Corning	Stream bed deposit, long, extensive and deep. Extends for about 18 miles upstream from confluence with Sacramento River. Width ranges from 0.1-0.3 mile, with average of 0.2 mile.	No overburden. Replenished in flood stage. Max. size at Hway 99 crossing about 6", about 5% plus 1½". Subangular to subrounded gravel	Graywacke 33 Vein quartz 24 Greenstone 27 Gneiss and quartzite 11 Chert 5 (USBR)	Martin Bros. Inc., Hway 99W., Richfield. NW¼ Sec. 35, T.25 N., R.3W., MDBM. 3 miles N. of Corning, west of Hway 99W.	Excavate with bottom scraper pulled by tractor. Stockpile in dry weather	Semi-portable plant. Jaw crusher, standard vibratory screens, screw-type sand classifier.	40 tons per hour	Concrete sand and gravel	Note: Following results are from tests on material produced by Baker Trucking Co. (which antedated Martin Bros.) from 1947-1949										
									No. of tests	5	6			3	3	4	6		4
									Range of results	2.65 to 2.70	2.62 to 2.75			4.6 to 6.0	15.4 to 27.4	0.5 to 3.4	0.7 to 2.2		
									Average	2.68	2.67			5.3	22.4	1.6	1.3		Satis.
Trinity River	(see **Klamath River**)																		
Van Duzen River, and tributary **Yager Creek,** Humboldt Co., South of Fortuna	Stream bed deposit and bars extend for about 6 miles upstream to the east of Alton. Deposit ranges from 0.2-0.4 mile in width, average 0.3 mile.	No overburden. Replenished in flood stage. Subangular to subrounded gravel.	Graywacke 72 Greenstone 8 Chert 7 Vein quartz 6 Limestone 4 Schist 3 Granite <1	Rock Prod. Div., Truck Lease Corp.; P.O. Box 69. Alton. SE¼ Sec. 23, T.2 N., R.1W., MDBM. ½ mile S. of Alton at intersection of river and Hway 101	Excavate from stream bed with slackline cableway.	Primary jaw crusher, standard vibratory screens	Estimate 200 tons per hour	Concrete sand and gravel	No. of tests	3	7	3	7	4	4	2	7	2	3
									Range of results	2.61 to 2.63	2.63 to 2.67	1.3 to 1.8	1.2 to 1.8	4.2 to 5.0	21.4 to 25.2	4.1 to 4.4	6.6 to 15.9	87 to 98	
									Average	2.62	2.65	1.6	1.5	4.9	23.8	4.3	9.2	92	Satis.
Walker Creek, Glenn Co., near Willows	Extensive flood plain deposit between Willows and Orland (portion of Stony Creek fan). Developed area covers about ¼ square mile and is more than 25' deep.	About 5' of sandy overburden present. No replenishment. Less than 1% plus 1½". Material above water table (5' of overburden) used as road base. Clean gravel below suitable for concrete. Subangular to subrounded gravel.	Graywacke 56 Vein quartz 25 Greenstone 15 Schist 3 Conglomerate 1 Reworked Tehama formation gravel	Willows Ready Mix Concrete, Willows. Sec. 35, T.19N., R.3W., MDBM. 2 miles NE of Willows	Excavate from semi-circular pits roughly 100' in diameter. Work with dragline to 25' depth.	Triple-deck vibrating screens over bins of batch plant.	Capacity small. Limited by size of bins.	Concrete sand and gravel, plaster sand, fill.	No. of tests	3	6	3	6	1	1	1	2		
									Range of results	2.62 to 2.65	2.63 to 2.72	1.0 to 1.3	0.8 to 1.0	4.8	22.4	1.9	2.2 1.1		
									Average	2.63	2.66	1.2	0.9	4.8	22.4	1.9	1.7		

Name and Location	Type and Extent	General Features	Rock Types (percent)	Fixed Plant Operations					Laboratory Test Data											
				Name, Location of Operator	Pit Data	Processing Data	Reported Capacity	Products		Spec. Gravity		Absorption		Abrasion		Soundness		Sand Equiv.	Organic Content
										Sand	Gravel	Sand	Gravel	100 rev.	500 rev.	Sand	Gravel		
Yuba River, Yuba Co., NE of Marysville	Stream bed deposit extends for about 5 miles upstream from Marysville, about 500′ average width.	No overburden, Average size 2″ at Baldwin pit diminishing downstream. Predominantly sand at Marysville. Replenished during floods. Sub-angular to sub-rounded gravel.	Vein quartz---32 Granitic (incl. aplite and diorite)---30 Greenstone 16 Quartzite-- 8 Chert----- 8 Schist----- 5 Gneiss---- 1 Andesite - <1	Baldwin Contr. Co., Inc., P.O. Box 311, Marysville C. Sec. 3 T.15N., R.4E MDBM. End of Hallwood Road.	Excavate with dragline. Haul by truck to nearby plant.	Crusher, standard vibrating screens, sand drag.	Estimate 100 tons per hour.	Concrete sand and gravel.	No. of tests	7	10	7	10	4	4	3	8	5	10
									Range of results	2.63 to 2.70	2.67 to 2.75	1.0 to 1.7	0.8 to 1.4	3.2 to 4.7	18.0 to 23.8	2.1 to 2.8	0.5 to 3.3	86 to 99	
									Average	2.66	2.72	1.3	0.9	3.9	21.0	2.5	1.7	92	Satis.
				Yuba River Sand Co., P.O. Box 307, Marysville Sec. 24, T.15 N., R.3E., MDBM. Foot of B St., in Marysville.	Floating 8″ suction pump in river pumps slurry to plant.	Standard vibratory screens; dewater sand in classifiers. Use roll crusher for additional fines.	Gravel: 35 tons per hour; Sand: 185 tons per hour.	Concrete sand and gravel, plaster and filter sand.		2.63 2.59		1.2 1.1							Satis.
				Marysville Rock Prod. Co., 1312 Stafford Way, Yuba City, uses portable crusher to produce aggregate for local ready mix plants on intermittent basis from river in Marysville.															
	Dredge tailings, along Yuba River 5 miles NE of Marysville. Tailings cover a triangular area 2 miles at the base and 5 miles long, about 25′ thick.	Little overburden. Dry deposit. Maximum size 3″. Sub-angular to sub-rounded.		Baldwin Contr. Co., Inc., P.O. Box 311, Marysville. NW¼ Sec. 35, T.16N., R.4E., MDBM. End of Hooper Rd. (Walnut Rd.). About 6 miles NE of Marysville.	Bulldozer pushes tailings through a hopper onto a conveyor belt for transport to plant.	Four cone crushers, standard vibratory screens.	200 tons per hour.	Crusher run base.		2.60	2.77 2.75	1.7	1.0 1.1	3.6	18.4	3.5	2.3 2.2	90	Satis.
				Lester Rice and Son, 235 Sumner St., Yuba City intermittently operate portable Cedar Rapids crushing plant in tailings in SW¼ Sec. 36 (proj.).															

LIST OF PRODUCERS IN NORTHERN CALIFORNIA—1959

Operator	*Address*	*Location*
Butte County		
*Baldwin Construction Co., Inc.	P. O. Box 311, Marysville	Oroville Plant
*Butte Creek Rock Co.	P. O. Box 512, Chico	Chico
*Henry J. Kaiser Co.	Kaiser Bldg., 1924 Broadway, Oakland 12	Oroville Plant
*Marler & Sons Rock Co.	4640 Virginia Ave., Oroville	Oroville
*Mathews Readymix, Inc.	Route 1, Box 23, Gridley	Gridley
McCammon-Wunderlich	P. O. Box 359, Palo Alto	
*Pentz Gravel, Attn: L. E. Wheelock	Durham	Pentz
Perry & Rowe Sand & Gravel	P. O. Box 247, Live Oak	Biggs Plant
Ralph Tarrant Trucking	1344 La Burnam St., Chico	Chico
*Teichert Aggregates	E. 1st & Verbena Ave., Chico	Chico
Colusa County		
*Cortina Rock Products, Attn: Gene Godon	P. O. Box 357, Colusa	Colusa
Flores & Perry	4643 — 11th Ave., Hanford	
*Goforth Bros., Attn: Jack Goforth	227 Fifth St., Williams	Williams
M. J. Ruddy & Son	P. O. Box 3042, Modesto	
Del Norte County		
Anne Chapman	P. O. Box 2145, Klamath	Klamath
*Pelican Bay Construction Service, Inc.	Smith River	Smith River
Simpson Redwood Co.	Box A, Klamath	Klamath
Glenn County		
*Mack Rock & Sand Corp.	2325 Fern Ave., Chico	Chico
*Orland Sand & Gravel Co.	P. O. Box 765, Orland	Orland
Southern Pacific Co.	65 Market St., San Francisco	Wyo (Orland)
*Willows Ready Mix Concrete	Willows	Willows
Humboldt County		
A B S Aggregates, Inc.	P. O. Box 475, Arcata	Arcata
Arcata Sand & Gravel Co.	Rt. 3, Box 3009-B, Arcata	Arcata
D. J. Beasley	Phillipsville	Phillipsville
Blue Lake Sand & Gravel	Railroad & H, Blue Lake	Blue Lake
John Burman & Son	3022 G St., Eureka	
Delphia, Early & Crow	P. O. Box 607, Patterson	
*Eureka Sand and Gravel Co., Inc.	1955 Hilfiker Ave., Eureka	Eureka
Norman Fadel	P. O. Box 206, North Hollywood	
Granite Construction Co.	Box 900, Watsonville	
Tom Hull	930 Carson St., Eureka	Redwood Creek
Kadle Construction Co.	2277 River Road, Arcata	Arcata
Jesse Manley	RFD # 1, Box 112, Arcata	Arcata
McIntosh & McKnight Ready Mix Co.	Willow Creek	Willow Creek
*McWhorter & Dougherty, Inc.	P. O. Box 542, Fortuna	Fortuna
*Mercer Frazer Co., Inc.	2nd & Commercial Sts., Eureka	Arcata
Morrison-Knudsen	411 W. Fifth St., Los Angeles	

LIST OF PRODUCERS IN NORTHERN CALIFORNIA—1959—Continued

Operator	*Address*	*Location*
Rio Dell Gravel	Rio Dell	Rio Dell
*Rock Products Division of Truck Lease Corp.	550 El Camino Road, Menlo Park	Alton
Domingo Silva	Blue Lake	Blue Lake
*Arthur B. Siri, Inc.	1357 Cleveland St., Santa Rosa	Arcata
Robert Stewart	P. O. Box 687, Arcata	Eureka
Lake County		
Baun Construction Co.	P. O. Box 4057, Fresno	
Cache Creek Gravel Co.	Box 597, Clearlake Highlands	Clearlake
*F. M. Frazell	P. O. Box 914, Lakeport	Kelseyville
Marion R. Chiselin	Clearlake Oaks	Clearlake
Rodger E. Hellgren	P. O. Box 420, Clearlake Highlands	Clearlake Highlands
*Lange Bros., Attn: Harry Lange	P. O. Box 66, Lakeport	Kelseyville
H. L. McCabe	P. O. Box 66, Upper Lake	Upper Lake
Wright Bros.	Route 1, Box 226, Gridley	
Mendocino County		
J. O. Archibald	P. O. Box 968, Redwood City	
Ball & Simpson	300 Camille Ave., Danville	
*E. T. Baxman	Rt. 1, Box 633, Fort Bragg	Ten Mile River
*Ellison Gravel Co.	112 Harold St., Fort Bragg	Manchester
Al Erickson	P. O. Box 384, Napa	
*Ford Gravel Co.	P. O. Box 217, Ukiah	Ukiah
Frost & Fitzhugh	Willits	Willits
Granite Construction Co.	Box 900, Watsonville	
Huntington Bros.	P. O. Box 446, Napa	
*Pete Persico	P. O. Box 516, Willits	Willits
*Arthur B. Siri, Inc.	1357 Cleveland St., Santa Rosa	Ukiah
Sticker & Scott	2110 W. Magnolia Blvd., Burbank	
*Ukiah Gravel & Cement Co., Inc.	P. O. Box 187, Ukiah	Ukiah
*Willits Ready Mix	Rt. 1, Box 114, Willits	Willits
Modoc County		
*Moyer Gravel Co.	P. O. Box 25, Alturas	Alturas
Wright Bros.	Rt. 1, Box 226, Gridley	
Plumas County		
*Bellamy Corp. c/o C. W. Bellamy	P. O. Box 742, Quincy	Quincy
Freeman Fuel Co.	117 Commercial, Portola	Portola
Healy Construction Co.	P. O. Box 175, Palmdale	
E. G. Leonhardt	Chandler Road, Quincy	Quincy
*Plumas Readi-Mix Concrete	427 W. Main, Quincy	Quincy
T. W. Ramelli	Vinton	Vinton

* Discussed in report. Other producers are either government contractors who operate portable plants, or pit operations without fixed processing equipment.

LIST OF PRODUCERS IN NORTHERN CALIFORNIA—1959—Continued

Operator	*Address*	*Location*
Shasta County		
Anderson Ready Mix	Rupert Land, Anderson	Anderson
M. W. Brown	P. O. Box 827, Redding	Redding
T. B. Dodson Pit	Balls Ferry Road, Anderson	Anderson
Gibbons & Reed Co.	P. O. Box 2429, Salt Lake City, Utah	
*J. H. Hein Co.	P. O. Box 226, Redding	Redding
R. E. Hertel	2904 Regina Way, Sacramento	Burney
Leland Kerns	Burney	Burney
Lassen Sand & Gravel	Cassel	Cassel
Morgan Construction Co.	P. O. Box 904, Redding	Redding
*Oaks Sand Gravel & Cement Products Co. Attn: G. E. Oaks	P. O. Box 1847, Redding	Clear Creek
*Redding Sand & Gravel Inc.	P. O. Box 741, Redding	Redding
*Riley Trucking Co., Attn: Charles W. Riley	P. O. Box 1462, Redding	Redding
Willis Sanford	Falls River Mills, California	Falls River Mills
*Shea-Kaiser-MK-Macco-Raymond, JV	Whiskeytown	Redding
J. H. Trisdale	P. O. Box 779, Redding	
A. G. Valentine	Burney	Burney
Sierra County		
Leon Dotta	Loyalton	Loyalton
Siskiyou County		
J. C. Compton	Box 86, McMinnville, Oregon	Klamath River
Gibbons & Reed	P. O. Box 2429, Salt Lake City, Utah	
McCammon-Wunderlich	P. O. Box 359, Palo Alto	
*Mt. Shasta Gravel Co.	P. O. Box 836, Mt. Shasta	Mt. Shasta
Eric E. Schoonmaker	Rt. 1, Box 356, Yreka	Happy Camp, Seid, Ft. Jones
Wright Bros.	Rt. 1, Box 226, Gridley	
*Albert Young	112 Fourth St., Yreka	Yreka
Sutter County		
Fredrickson Bros.	1259—65th St., Emeryville	
Perry & Rowe	P. O. Box 297, Live Oak	Live Oak
Chester W. Stineman	Rt. 1, Box 10, Wheatland	Wheatland
Tehama County		
*Allen & Reddy Sand & Gravel	P. O. Box 729, Red Bluff	Red Bluff
H. P. Edwards	P. O. Box 814, Red Bluff	
Richard Ehorn	124 S. Jackson, Red Bluff	
*Martin Brothers, Inc.	Highway 99 W, Richfield	Richfield
*Red Bluff Sand & Gravel Co. Attn: G. E. Oaks	P. O. Box 1847, Redding	Red Bluff
Starnes Sand & Gravel	P. O. Box 366, Gerber	
	Santa Rosa and Chipman Ave., Gerber	Gerber
Thomas Construction Co.	P. O. Box 683, Fresno	
Stephen L. Vistica	70 N. El Camino Real, San Mateo	

LIST OF PRODUCERS IN NORTHERN CALIFORNIA—1959—Continued

Operator	*Address*	*Location*
Trinity County		
C. E. Ruberts & Son	363 E. Elm Ave., Coalinga	Lewiston
*Trinity Sand & Gravel Co.	Weaverville	Douglas City
Yuba County		
*Baldwin Contracting Co., Inc.	P. O. Box 311, Marysville	Hallwood and Yuba River
*Marysville Rock Products Co.	1312 Stafford Way, Yuba City	Marysville
H. Earl Parker, Inc.	12th and F Sts., Marysville	
*Lester Rice & Son	235 Sumner St., P. O. Box 408, Yuba City	Marysville
B. C. Richter	1955 Mitchel Ave., Oroville	
*Yuba River Sand Co.	P. O. Box 307, Marysville	Marysville

* Discussed in report. Other producers are either government contractors who operate portable plants, or pit operations without fixed processing equipment.

CROSS-INDEX TO OPERATORS

Name of Operator	Deposit
Allen and Reddy Sand and Gravel	Sacramento River
Baldwin Contracting Company, Inc.	Dry Creek
Baldwin Contracting Company, Inc.	Feather River
Baldwin Contracting Company, Inc.	Yuba River
E. T. Baxman	Ten Mile River
Bellamy Corporation	Spanish Creek
Butte Creek Rock Company	Butte Creek
Cortina Rock Products	Sacramento River
Ellison Gravel Company	Garcia River
Eureka Sand and Gravel Company, Inc.	Mad River
Ford Gravel Company	Russian River
F. M. Frazell	Kelsey Creek
Goforth Bros.	Cortina Creek
Goforth Bros.	Sand Creek
J. H. Hein Company	Sacramento River
Henry J. Kaiser Company	Feather River
Lange Bros.	Kelsey Creek
Mack Rock and Sand Corporation	Stony Creek
Marler and Sons Rock Company	Dry Creek
Martin Brothers, Inc.	Thomes Creek
Marysville Rock Products Company	Yuba River
Mathews Readymix, Inc.	Feather River
McWhorter and Dougherty, Inc.	Eel River
Mercer Frazer Company, Inc.	Mad River
Moyer Gravel Company	Pit River
Mt. Shasta Gravel Company	Mt. Shasta Pit
Oaks Sand Gravel and Cement Products Company	Clear Creek
Orland Sand and Gravel Company	Stony Creek
Pelican Bay Construction Service, Inc.	Smith River
Pentz Gravel	Cherokee Tailings
Pete Persico	Davis Creek
Plumas Readi-Mix Concrete	Spanish Creek
Red Bluff Sand and Gravel Company	Sacramento River
Redding Sand and Gravel, Inc.	Sacramento River
Riley Trucking Company	Churn Creek
Rock Products Division of Truck Lease Corp.	Van Duzen River
Eric E. Schoonmaker	Klamath (Scott River)
Shea-Kaiser-MK-Macco-Raymond	Sacramento River
Arthur B. Siri, Inc.	Mad River
Arthur B. Siri, Inc.	Russian River
Teichert Aggregates	Sacramento River
Trinity Sand and Gravel Company	Klamath (Trinity River)
Ukiah Gravel and Cement Company, Inc.	Russian River
Willits Ready Mix	David Creek
Willows Ready Mix Concrete	Walker Creek
Albert Young	Greenhorn Creek
Yuba River Sand Company	Yuba River

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YUBA
PELICAN BAY CONST SERVICES
Crescent City
ALBERT YOUNG (Tailings)
Yreka
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Klamath River
Klamath
MT SHASTA GRAVEL CO
Mt Shasta
MOHER GRAVEL CO
Alturas
Pit River
Weitchpec
Orleans
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EUREKA SAND & GRAVEL
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REDDING SAND & GRAVEL CO
J M HEIN CO
OAKS SAND, GRAVEL & CEM PROD CO
SHEA-KAISER-MK-MACGO-RAYMOND
McWHIRTER & DOUGHERTY
ROCK PROD DIV
TRUCK LEASE CORP
Fortuna
Ferndale
Alton
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Eel River
Anderson
Anderson Cr
Cottonwood
Cottonwood Cr
Susanville
Olive Knit
RED BLUFF SAND & GRAVEL CO
Red Bluff
ALLEN & REDDY SAND & GRAVEL
Los Molinos
MARTIN BRO
Gerber
Vina
Garberville
South Fork Eel River
Thomas Cr
BELLAMY CORP
Quincy
Feather River
Spanish Cr
ORLAND SAND & GRAVEL CO
EICHERT AGGREGATES
Orland
Hamilton
MACK ROCK & SAND CORP
Chico
BUTTE CREEK ROCK CO
CHEROKEE (Tailings)
Cherokee
PENTZ GRAVEL
BALDWIN CONST CO
MARLER & SONS ROCK CO
Oroville
Stony Cr
Willows
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Sacramento River
Princeton
East Biggs
Gridley
MATHEWS READYMIX
CORTINA ROCK PROD PIT
Colusa
Williams
Yuba City
Marysville
BALDWIN CONST CO
LESTER RICE & SON PIT
YUBA RIVER SAND CO
Wheatland
Arbuckle
Sutter Buttes
Feather River
Bear River
Cache Cr
Putah Cr
Middletown
Lake Pillsbury
Upper Lake
Lakeport
Clear Lake
Kelseyville
Cobb Mtn
Hough Springs
Long Valley
Indian Valley Reservoir
Cache Creek
Capay
Hopland
Ukiah
Willits
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North Fork Eel River
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Mattole River
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